SmartCow®

An AI Engineering Company

Soter User's Manual

Version 1, March 2023

Copyright and legal statement

Disclaimer

The information in this document is subject to change without prior notice and does not represent commitment.

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Acknowledgements

Declaration of conformity

FCC

This equipment has been tested and verified to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area (domestic environment) is likely to cause harmful interference, in which case the user will be required to correct the interference (take adequate measures) at their own expense.

CE

The product described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

Safety precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references.

- All cautions and warnings on the device should be noted.
- All cables and adapters supplied by SmartCow are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by SmartCow to prevent system malfunction or fires.
- Make sure the power source matches the power rating of the device.
- Position the power cord so that people cannot step on it. Do not place anything over the power cord.
- Always completely disconnect the power before working on the system's hardware.
- No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
- If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
- Always disconnect this device from any AC supply before cleaning.
- While cleaning, use a damp cloth instead of liquid or spray detergents.
- Make sure the device is installed near a power outlet and is easily accessible.
- Keep this device away from humidity.
- Place the device on a solid surface during installation to prevent falls.
- Do not cover the openings on the device to ensure optimal heat dissipation.
- Watch out for high temperatures when the system is running.
- Do not touch the heat sink or heat spreader when the system is running.
- Never pour any liquid into the openings. This could cause fire or electric shock.
- As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.
- If any of the following situations arises, please contact our service personnel:
    - Damaged power cord or plug
    - Liquid intrusion to the device
    - Exposure to moisture
    - Device is not working as expected or in a manner as described in this manual
    - The device is dropped or damaged
    - Any obvious signs of damage displayed on the device
- Do not leave this device in an uncontrolled environment with temperatures beyond the device's permitted environment with temperatures (see specification) to prevent damage.

Warranty and RMA

Warranty Period

SmartCow warrants that products will be free from defects in material and workmanship for 2 years (24 months), beginning on the date of invoice by SmartCow. SmartCow will provide free of charge warranty coverage to all the products manufactured and sold in case the purchased product is proven defective in material or workmanship under normal use during the warranty period.

Return Merchandise Authorization (RMA)

- Customers can claim RMA service by requesting “SmartCow RMA Service Form” from the account manager. After filling out the form, the account manager will reply with a corresponding RMA number.
- Customers must collect all the information about the problems encountered and note anything abnormal or, print out any on-screen messages, and describe the problems on the “SmartCow RMA Service Form” for the RMA number application process.
- Customers shall return the RMA to SmartCow within 7 working days after the RMA number was generated and enclose the “SmartCow RMA Service Form” with the returned packages.
- SmartCow has the right to refuse providing repair services for products no longer in warranty. If SmartCow chooses to provide repair services, the customer will be charged for the repair fees and component fees. Additionally, the needed repairing time depends on component acquisition.
- Any products returned by SmartCow to other locations besides the customers’ site will bear an extra charge and will be billed to the customer.

RoHS compliance

SmartCow RoHS environmental policy

SmartCow is a global citizen for building digital infrastructure. We are committed to providing green products and services, which are compliant with European Union RoHS (Restriction on Use of Hazardous Substance in Electronic Equipment) directive 2011/65/EU and 2015/863, to be your trusted green partner and to protect our environment.

RoHS restricts the use of Lead (Pb) < 0.1% or 1,000ppm, Mercury (Hg) < 0.1% or 1,000ppm, Cadmium (Cd) < 0.01% or 100 ppm, Hexavalent Chromium (Cr6+) < 0.1% or 1,000ppm, Polybrominated biphenyls (PBB) < 0.1% or 1,000ppm, and Polybrominated diphenyl Ethers (PBDE) < 0.1% or 1,000ppm.

In order to meet the RoHS compliant directives, SmartCow has established an engineering and manufacturing task force to implement the introduction of green products. The task force will ensure that we follow the standard SmartCow development procedure and that all the new RoHS components and new manufacturing processes maintain the highest industry quality levels for which SmartCow is renowned.

The model selection criteria will be based on market demand. Vendors and suppliers will ensure that all designed components will be RoHS compliant.

Contents

Introduction 1

Topics:

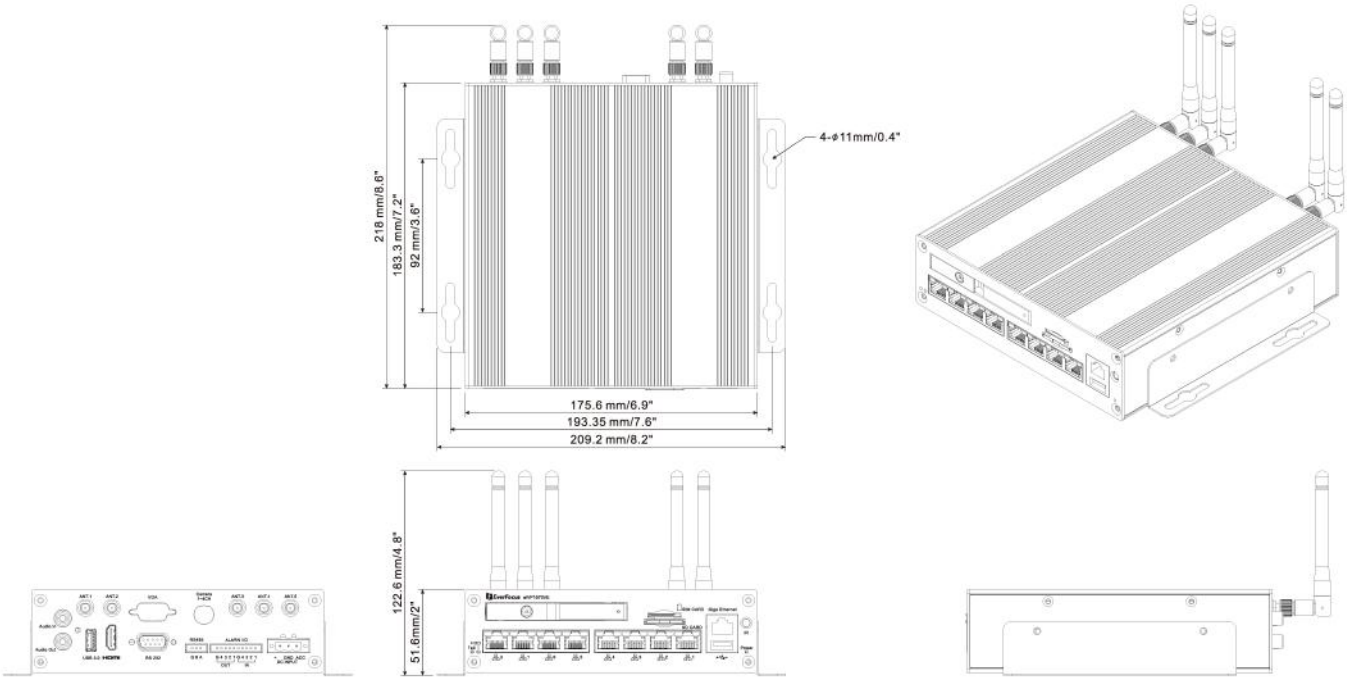
Soter is a fanless AI edge network video recorder.

Soter is powered by the NVIDIA® Jetson Xavier™ NX module. It features eight PoE ports for Ethernet cameras. Soter is ideal for machine vision applications.

SmartCow supplies the hardware as well as integration with the AINVR software.

1.1 Dimensions

The following figure shows Soter's dimensions from the front, back, top, and sides.



1.2 Packing list

Soter has two main items in its packing list.

Item	Description	Quantity
HAEG-SS1	AI NVR system with NVIDIA Jetson module	1
Power adapter	DC 19V/4.73A, Terminal block	1

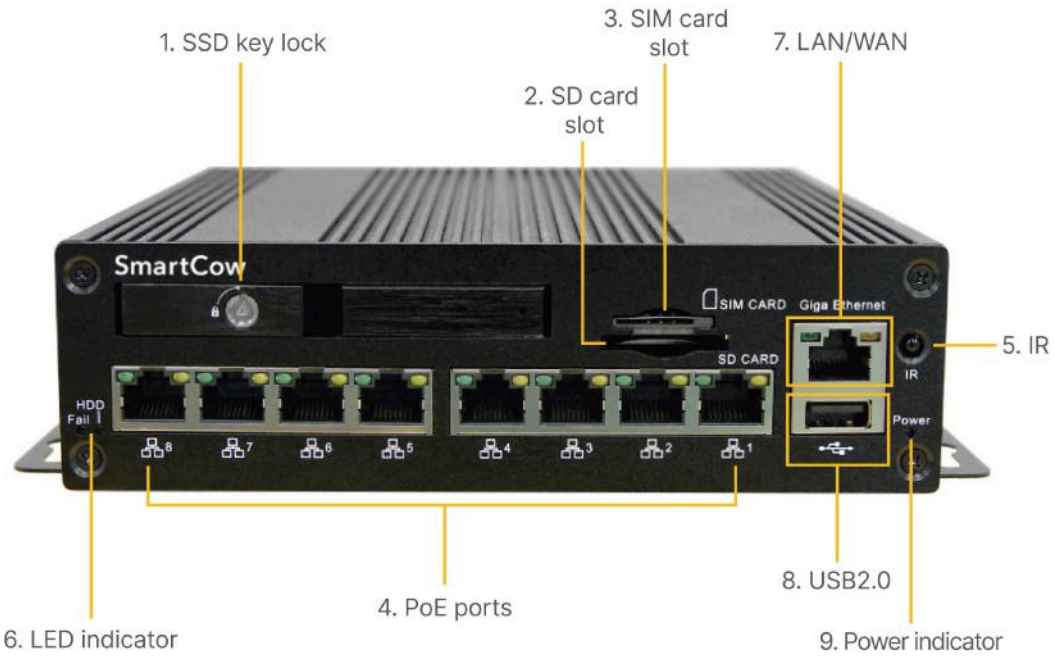
1.3 Optional accessories

Soter has several optional accessories.

Part number	Description
1Y0701830000HY	US power cord
1Y0701830100HY	EU power cord
51-U0000000004	Quectel EP06 Series (LTE Cat.6)
	LTE antenna and coaxial cable
	2.5-inch SATA SSD
51-U0000000005	Wi-Fi module
	Wi-Fi antenna and coaxial cable

1.4 Front panel

The following figure shows the key components of Soter's front panel.

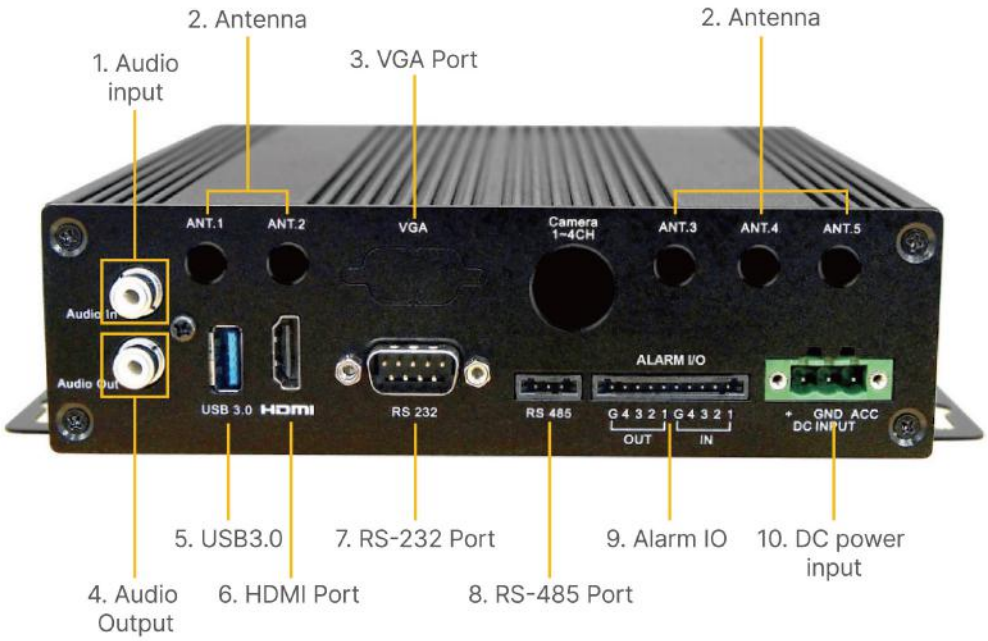


Number	Name	Description
1	SSD key lock	Lock and unlock the SSD tray.
2	SD card slot	SD card slot.
3	SIM card slot	SIM card slot.
4	PoE ports	PoE ports (10/100 MbE, total 75W) for connecting to the IP cameras or other PoE devices.
5	IR	This function is currently reserved.
6	LED indicator	HDD: HDD LED indicator. Fail: System fail LED indicator.
7	LAN/WAN	One 10/100/1000 Base-Tx Ethernet ports for connecting to the network.

Number	Name	Description
8	USB2.0	USB2.0 port.
9	Power indicator	Power LED indicator.

1.5 Rear panel

The following figure shows the key components of Soter's rear panel.



Number	Name	Description
1	Audio input	Connects to audio input devices, such as microphones. Note that the microphones with a (built-in) amplifier and external power supply are required.
2	Antenna	Connects the antenna to the AI mobile NVR for 3G/4G/Wi-Fi/GPS functions.
3	VGA Port	This port is currently reserved.
4	Audio Output	Connects to an audio output device, such as speakers. Note that the speakers with a (built-in) amplifier and external power supply are required.
5	USB3.0	USB3.0 port.
6	HDMI Port	HDMI display output.
7	RS-232 Port	COM port for RS-232.
8	RS-485 Port	COM port for RS-485.

Number	Name	Description

9	Alarm IO	Provides 4 digital inputs and 4 digital outputs
		• Digital Input
		  • Input Voltage (Dry contact)
		  • Logic 0: Close to GND
		  • Logic 1: Di input 5~32V
		• Digital Output
		  • Supply Voltage: 5V output (Wet contact)
		  • Sink Current: 200mA Max. per channel

10	DC power input	Connects to the power source.

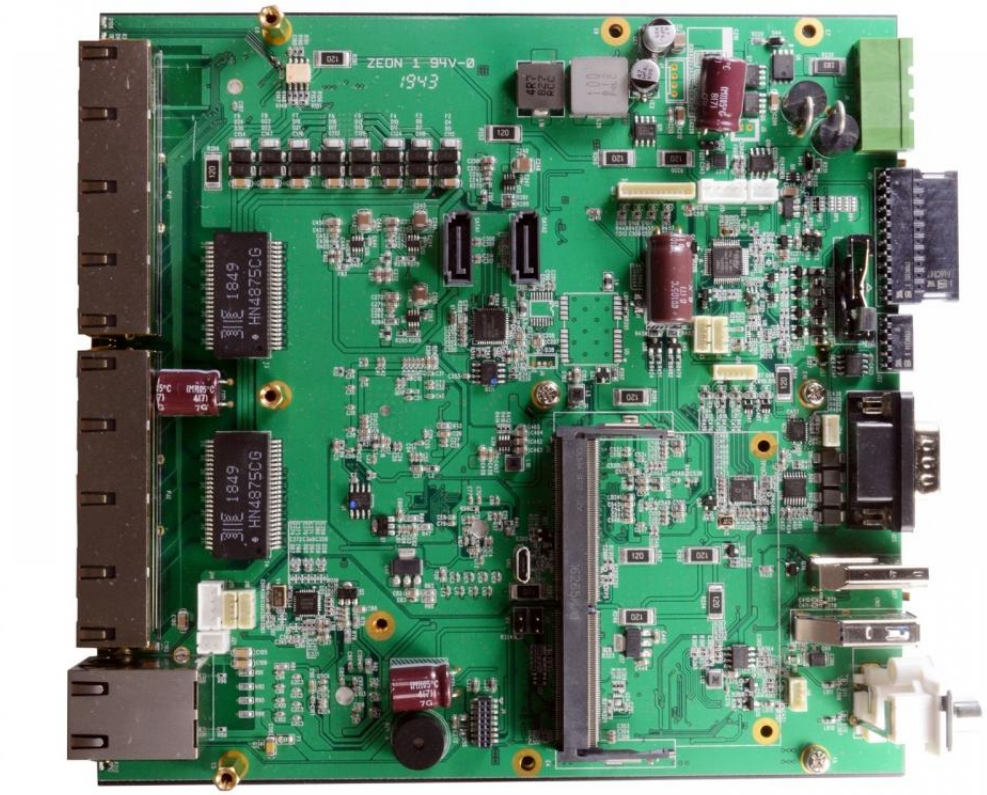
1.6 Carrier board

The following table shows the dimensions of Soter's main board, power board, and I/O board.

Dimensions (W x D x H)
Main board: 170 × 179.3 × 35mm / 6.7" × 7.1" × 1.38"
Power board: 30.1 × 98 × 25mm / 1.19" × 3.85" × 0.98"
I/O board: 45 × 98.3 × 18mm / 1.77" × 3.87" × 0.71"

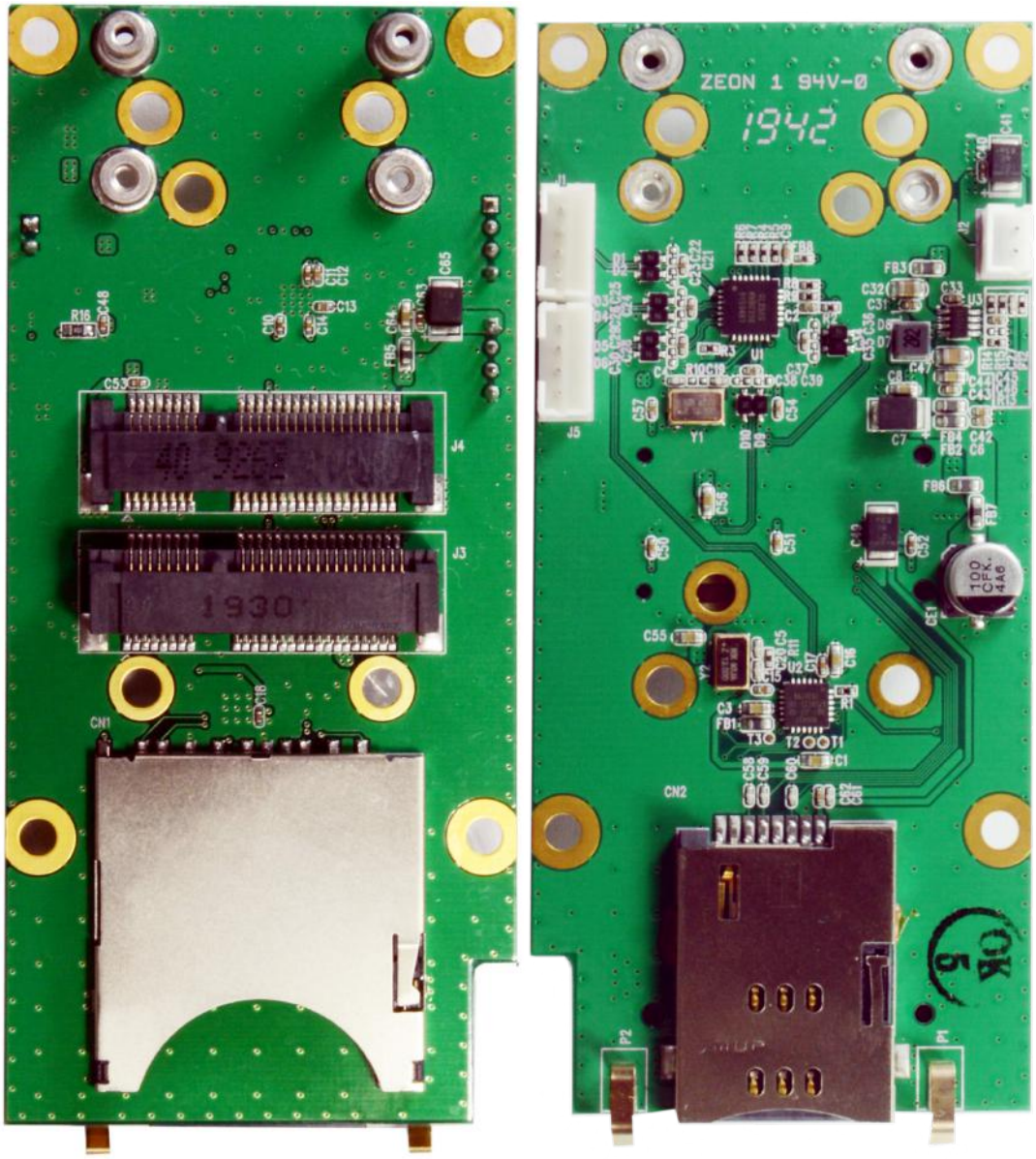
1.6.1 Main board

The following figures show Soter's main board from the top view and side view.



1.6.2 I/O board

The following figures display Soter's I/O board.


ZEON 1 94V-0
1942
1930
CN1
CN2
J3
J4
J5
P1
P2
Y1
U1
U2
T1
T2
T3

Connection and installation 2

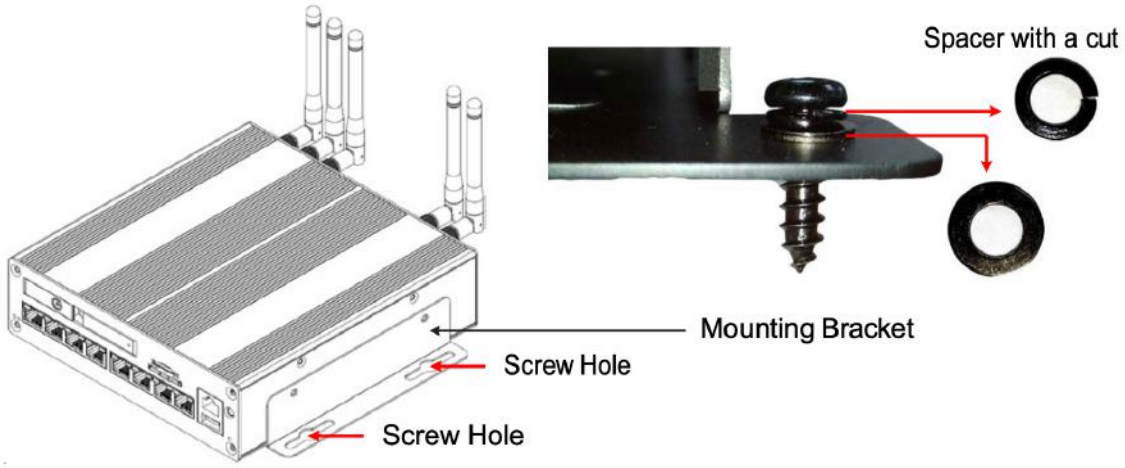
Topics:

This section describes how to set up Soter and what you need for a successful installation.

2.1 Mounting

The following figure demonstrates how to mount an AI mobile NVR onto Soter.

The mounting bracket is already installed. To mount the AI mobile NVR, use the supplied four black screws and eight spacers (place two spacers on each screw hole).



2.2 Installing an OS image on Soter

About this task

To install an OS image on Soter, you need an Ubuntu computer.

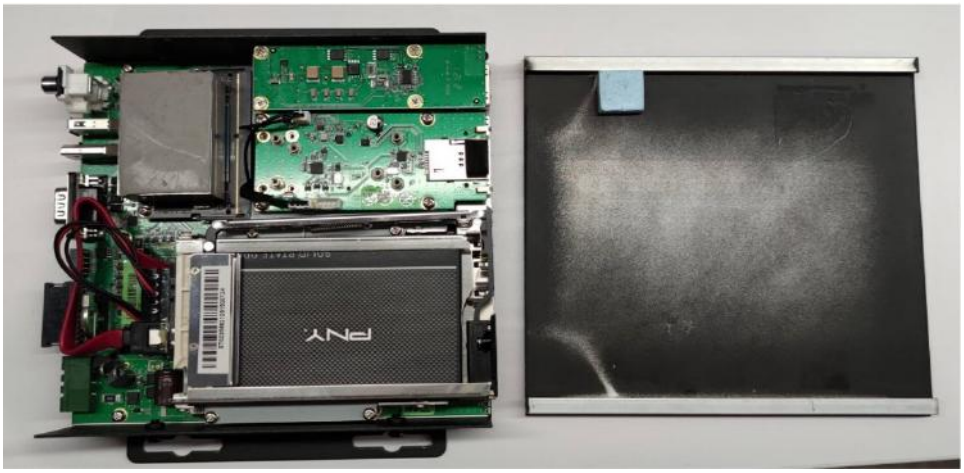
Procedure

1. Prepare an Ubuntu machine to boot up the OS Image.
2. Download the OS Image from the link provided by SmartCow.
3. Place the `tar.bz2` file (in the `tar.bz2` format) into the home folder of the Ubuntu computer.
4. Set up Ubuntu on the device.
   a) Open the top cover to find the Micro USB socket and jumper.
   To open the top cover, remove all the screws on the device, as shown in the following figures.
   Screws on Soter's front.

Screws on Soter's back.

Screws on Soter's sides.

This is what the device looks like with its top removed.



b) Find the jumper to plug in the J12 header (2) and short the jumper.

Boot the device into recovery mode after shorting the jumper.

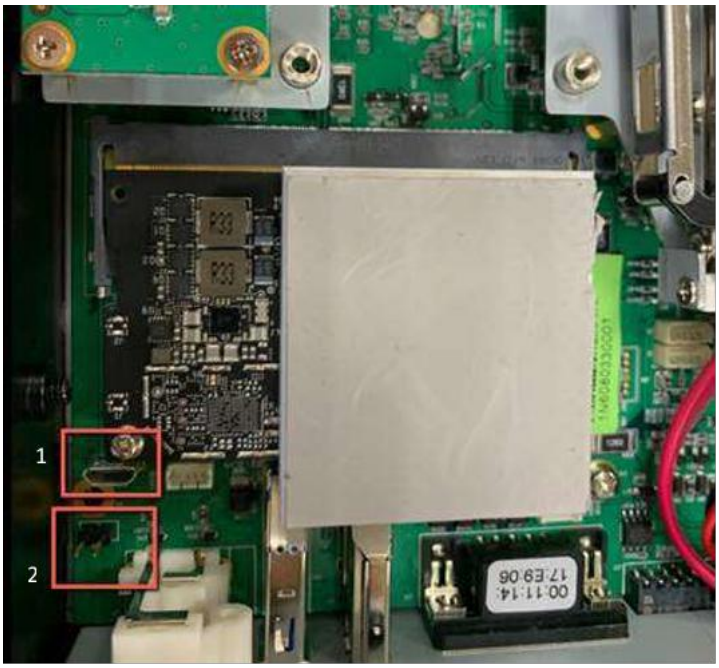


Figure 1: J12 header and Micro USB socket.

- 1: Micro USB socket
- 2: J12 header

c) Find a Micro USB to USB-A cable to connect to the Micro USB socket (1).

d) Connect the USB-A to the Ubuntu computer.

e) Turn on the device.

5. On the Ubuntu computer, search for the Terminal application to run the following commands.

a) Extract the `tra.bz2` file.

```
tar –xjvf <file_name>.tar.bz2
```

Where, *<file_name>* is the file name of the Terminal application.

b) Change the directory to the unzipped folder and use the following command to start image flashing.

```
cd <file_name>
```

```
sudo ./nvmflash.sh
```

You can see the progress and know when it is done.

6. Turn off the device.

7. Unplug the micro USB cable, and remove the jumper on J12.

8. Connect the keyboard, mouse, and monitor.
9. Connect Soter to power, then turn Soter on.
10. Follow the installation guide and set up your own credentials.
11. After you see the Installation Complete pop up window, click on the **Restart Now** button to restart the device.
12. Log in to the Ubuntu computer with your account and password.
13. Run the following commands to update and upgrade the OS.

```
sudo apt-get update
```

```
sudo apt-get upgrade
```

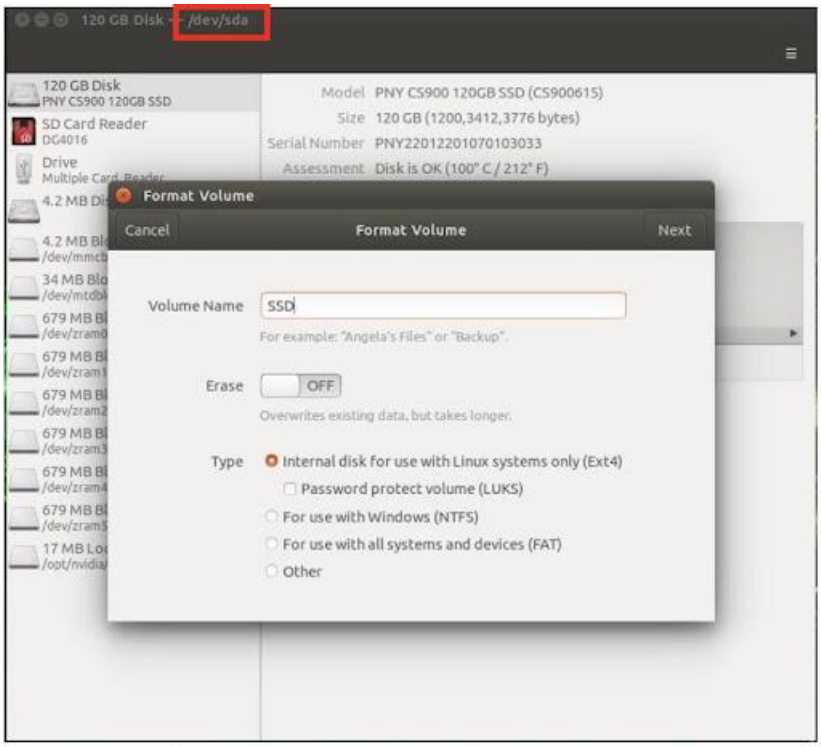
2.3 Booting from an external SSD

About this task

There are seven main steps for booting Soter from an external SSD.

Procedure

1. Boot the device from eMMC and format the external SSD to **Ext4** using the Disks Utility application.

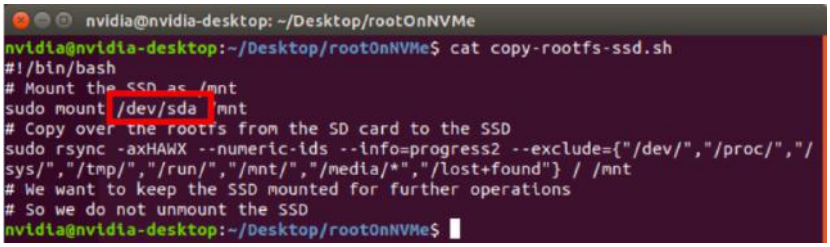


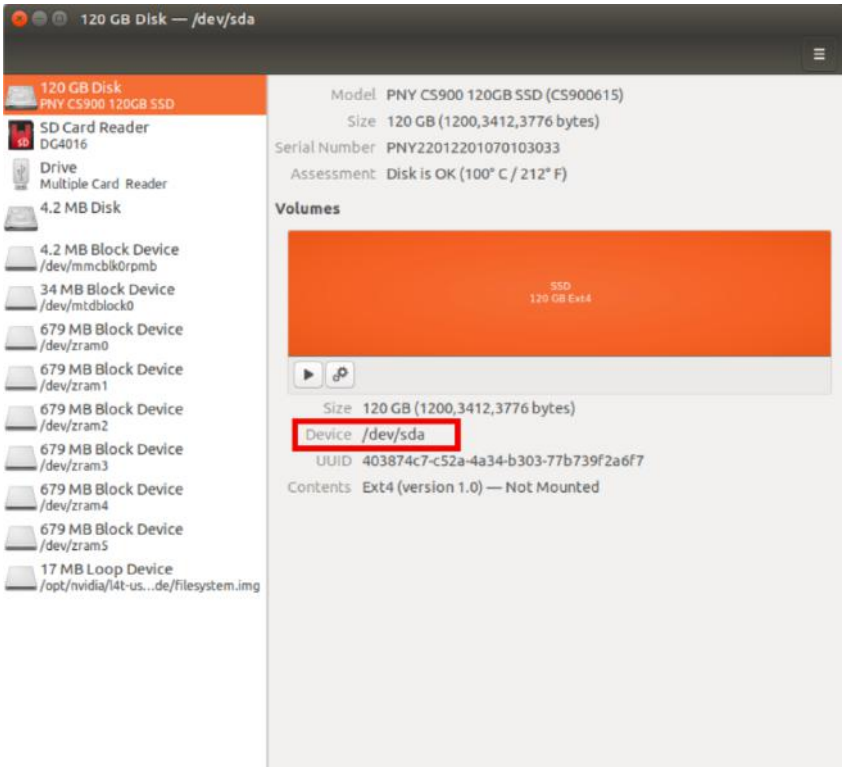
2. Switch the `rootfs` to the SSD by running the `rootOnNVMe` script on the device's eMMC.

```
git clone https://github.com/jetsonhacks/rootOnNVMe.git cd rootOnNVMe/
```

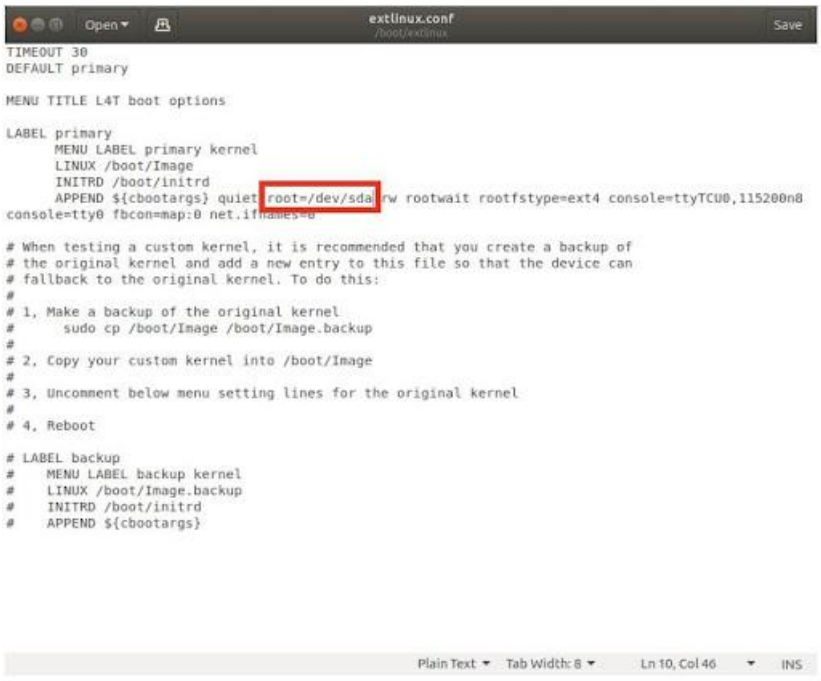
For more information, refer to the `README.md` file from the `.git` link.

3. Ensure that the mount device is the same as your SSD.





4. Edit the root path in the config file located in `/boot/extlinux/extlinux.conf` for the changes to take effect.



5. Copy the `rootfs` of the eMMC to the SSD.

```
sudo ./copy-rootfs-ssd.sh
```

6. Restart the device for the changes to take effect.
7. Install NVIDIA CUDA Toolkit (v10.2).
   https://developer.nvidia.com/cuda-10.2-download-archive
8. Install DeepStream SDK (v6.0).
   https://docs.nvidia.com/metropolis/deepstream/dev-guide/text/DS_Quickstart.html
9. NVIDIA CUDA Toolkit and DeepStream SDK are compatible with the BSP version.

Specification 3

These are the key specifications of Soter.

NVIDIA Jetson Xavier NX	Xavier NX 16GB	CPU	6-core NVIDIA Carmel ARM®v8.2 64-bit CPU 6MB L2 + 4MB L3 processor
		GPU	NVIDIA Volta™ architecture with 384 NVIDIA CUDA® cores and 48 Tensor cores
		Memory	16GB 128-bit LPDDR4x @ 59.7GB/s
		Storage	16GB eMMC 5.1
	Xavier NX 8GB	CPU	6-core NVIDIA Carmel ARM®v8.2 64-bit CPU 6MB L2 + 4MB L3 processor
		GPU	NVIDIA Volta™architecture with 384 NVIDIA CUDA® cores and 48 Tensor cores
		Memory	8GB 128-bit LPDDR4x @ 59.7GB/s
		Storage	16GB eMMC 5.1
General	BSP	Jetpack 4.6	
	Power input	DC 9-36V (with ignition pin)	
	Certification	CE, FCC	
Physical I/O	Front I/O	1 x IR receiver 1 x USB 2.0 1 x GbE port 8 x PoE port 1 x Micro USB2.0 (Internal OTG) 1 x 2.5“ SSD bay 1 x SIM card slot 3 x LED indicator (HDD, Fail, Power)	
	Rear I/O	1 x Audio input 1 x Audio output 1 x USB 3.0 1 x RS232 1 x RS485 1 x HDMI 4 x Alarm I/O (4-input, 4-output) 1 x Power input 5 x Antenna port	

Expansion	Expansion slot	2 x Mini PCIe (1 x full-size USB2.0, 1 x half-size USB2.0)
	GPS/ G-Sensor	Onboard G-Sensor, GPS optional
Environment	Operating temperature	–20°C - +65°C
	Storage temperature	–20°C - +85°C
	Storage humidity	95% @ 40°C (non-condensing)
Mechanical	Dimension	175.6 × 183.3 × 50.5mm (L × W × H) (without bracket)
	Weight	1.8kg

Document control

Document Version	Product Version	Release Date
1.0	1.0	2023-03-29